



Preparing for Career Success
in Science, Technology,
Engineering and Mathematics



Career Clusters Prepare All Students for College, Technical Training, Apprenticeships and Careers

Career Clusters prepare learners of all ages for the information age as schools, colleges, and employers strive for higher achievement in science, math and communication. One key to improving learner achievement is providing learners with relevant contexts for studying and learning. Career Clusters offer these contexts by linking school-based learning with the knowledge and skills required for continued success.

The Concept of Career Clusters

Career Clusters identify the knowledge and skills learners need as they follow a pathway toward their career goals. The knowledge and skills identified form a strong basis for learner success whether the learners are in high school, college, technical training, an apprenticeship program or in the workplace.

How to Pursue Education and Training in Engineering and Mathematics

There are thousands of challenging educational and training opportunities within the high-skilled world of Science, Technology, Engineering and Mathematics. Learners need a solid background in math, science



and technical skills. Education and training can be obtained in high schools, technical colleges, two-year community colleges, four-year colleges and career technical schools/institutes.

Along the way, career guidance professionals assist learners in assessing their

educational goals, interests, abilities and skills to facilitate a good match to the cluster's pathway options. Learners participate in relevant educational opportunities framed in the context of the cluster. They gain knowledge and skills through coordinated workplace learning experiences such as site visits, job shadowing and internships. If they choose, they may achieve valuable skill certifications that lead to employment. Colleges and universities offer advanced degrees and industry certifications that prepare learners for professional and technical careers.



Career Pathways at a Glance

The Science, Technology, Engineering and Mathematics Career Cluster is divided into two pathways. Pathways are grouped by the knowledge and skills required of occupations in these career fields. Each pathway provides instruction, which will give you the foundations necessary to become successful in any of several careers and educational pursuits.



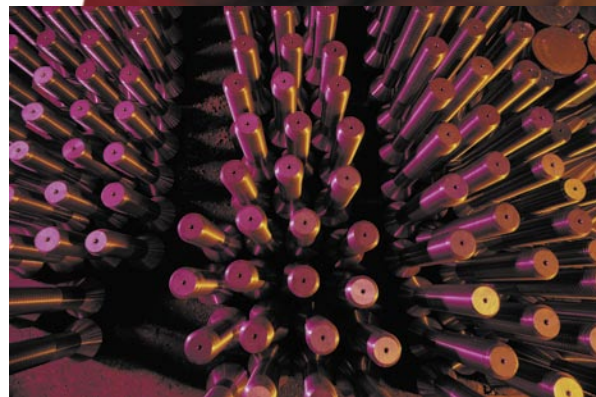
The Two Pathways

- Science and Mathematics
- Engineering and Technology

What Is the Science, Technology, Engineering and Mathematics Career Cluster?

A career in science, technology, engineering or mathematics is exciting,

challenging, and ever-changing. Learners who pursue one of these career fields will be involved in planning, managing, and providing scientific research and professional and technical services including laboratory and testing services, and research and development services.



Employment Outlook

Given the critical nature of much of the work in science, technology, engineering and mathematics, job possibilities abound even in times of economic downturn. More scientists, technologists and engineers will be needed to

meet environmental regulations and to develop methods of cleaning up existing hazards. A shift in emphasis toward preventing problems rather than controlling those that already exist, as well as increasing public health concerns, also will spur demand for these positions.

Science and Mathematics

Overview

Those who choose careers in the Science and Mathematics pathway apply essential mathematics and science content and skills in a real world context. Science and mathematics occupations include those in



physical, environmental and human endeavors. Career possibilities range from teachers of science and mathematics to lab technicians to NASA astronauts. Preparation for



such occupations require the following:

1. Understanding the process and applying the skills necessary to engage in discovery.
2. Recognizing the need to obtain a broad education in science and mathematics and share (communicate) this knowledge with the world.
3. Understanding the role of gathering, creating, processing and sharing data in science and mathematics.

Sample Occupations

- Biologist
- Chemist
- Economist
- Geneticist
- Physicist
- Quality-Control Scientist
- Mathematician
- Statistician
- Research Technician



- Science Teacher
- Scientific Visualization / Graphics Expert
- Lab Technician

Credentials

Science and mathematics education can be obtained in technical colleges and institutes, two-year community colleges, and four-year colleges and universities. Academic foundations for

science and mathematics are laid in high school, in course work as well as through participation in science fairs and mathematics student competitions. Credentials in this field include:

- A.A., B.S., M.S. and Ph.D. Degrees
- Certified Drafter (CD)
- Certified Consulting Meteorologist (CCM)
- Approved Chemist
- Certified Mapping Scientist-GIS/LIS
- Registered Laboratory Technician
- Teacher Certification

Employment Outlook

Job opportunities are expected to be best for qualified graduates of science and mathematics training programs or applied science and mathematics programs who are trained on equipment used in industrial and government laboratories and production facilities. As the instrumentation and techniques used in industrial research, development and production become increasingly more complex, employers are seeking well-trained individuals with highly developed technical and communication skills.

Engineering and Technology

Overview

For a future in the Engineering and Technology pathway, students should study and apply principles from advanced mathematics, life sciences, physical science, earth and space science, and technology. In addition, future engineers and technologists should learn certain processes in mathematics, science and technology.

In Grades 9-12, all future engineers and technologists should study mathematics each year, learning important mathematical concepts and processes defined by the National Council of Teachers of Mathematics in *Principles and Standards for School Mathematics*. With such knowledge and skills, students will be able to demonstrate the following competencies:

- Apply mathematics, science and technology concepts to solve problems quantitatively in engineering projects involving design, develop-

ment or production in various technologies.

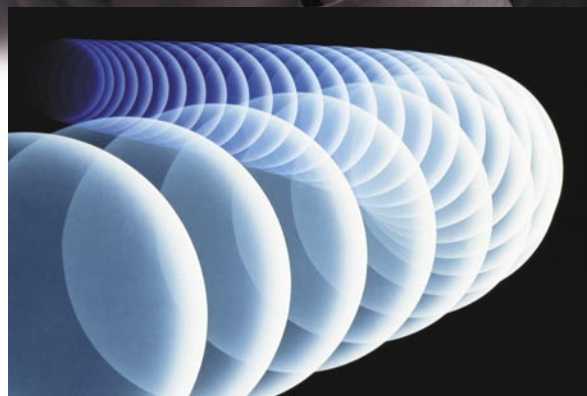
- Recognize the core concepts of technology and their relationships with engineering, science and math, and other subjects.

All future engineers and technologists should learn important science concepts and processes with an understanding of physics,



chemistry and biology as a minimal set. These concepts and processes are defined by the National Research Council in the *National Science Education Standards* and by the American

Association for the Advancement of Science in *Benchmarks for Science Literacy*. Additionally, learners should become proficient in the areas of technology defined by the *Standards for Technological Literacy*.



Sample Occupations

- Aeronautical Engineer
- Architectural Engineer
- Biotechnology Engineer
- Chemical Engineer
- Civil Engineer
- Construction Engineer
- Industrial Engineer
- Mechanical Engineer
- Materials Lab and Supply Technician
- Quality Technician
- Drafter
- Technical Writer

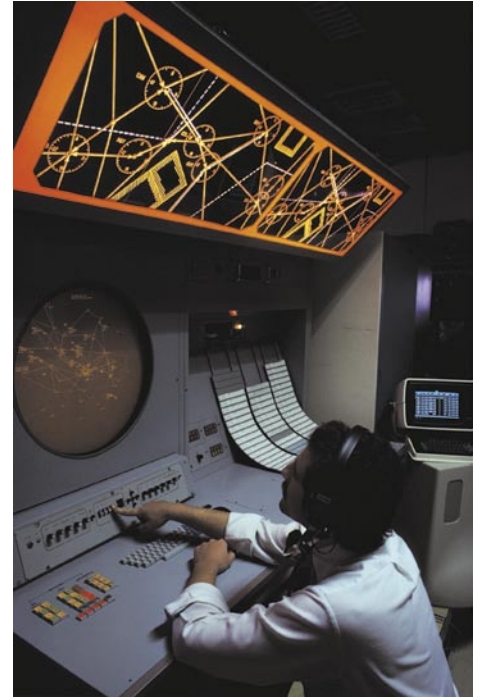


and technology are laid in high school, in course work as well as through participation in engineering and technology student organizations and student competitions. Student organizations include the Technology Student Association (TSA) and the Junior Engineering Technical Society (JETS).

Employment Outlook

The job outlook for engineers and technologists continues to look promising because competitive pressures and advancing technology will force companies to improve and update product designs and to optimize their manufacturing processes. Also, additional engineers and technologists will be needed

to improve or build new roads, bridges, water and pollution control systems, and other public facilities.



Credentials

Engineering and technology education can be obtained in technical colleges and institutes, two-year community colleges, and four-year colleges and universities. Academic foundations for engineering

Certifications include:

- Certified Quality Engineer (CQE)
- Certified Electronic Technician (CET)
- Certified Drafter (CD)
- Certified Industrial Technologist (CIT)
- Certified Professional Chemical Engineer (CPChE)





The 16 Career Clusters

Agriculture, Food & Natural Resources
Architecture & Construction
Arts, A/V Technology & Communications
Business, Management & Administration
Education & Training
Finance
Government & Public Administration
Health Science
Hospitality & Tourism
Human Services
Information Technology
Law, Public Safety, Corrections & Security
Manufacturing
Marketing, Sales & Service
Science, Technology, Engineering & Mathematics
Transportation, Distribution & Logistics



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